MICA MICA A POOL WATERFLOODING

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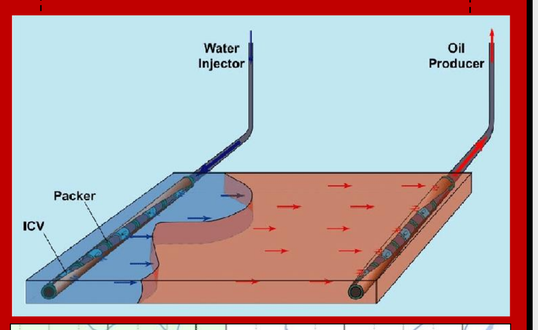
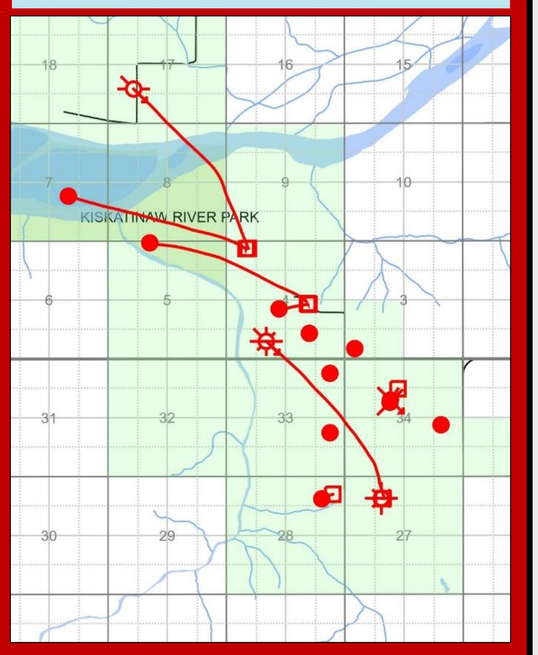
ABSTRACT

Waterflooding is a widely used secondary recovery method in the petroleum industry that involves injecting water into an oil reservoir to enhance the production of oil. The process of waterflooding has been found to have a significant impact on the production of oil by changing the properties of the reservoir and improving the recovery factor.
Waterflooding alters the fluid dynamics of the reservoir by introducing a new fluid that displaces the oil, allowing it to move towards the production well. The injected water also helps to reduce the viscosity of the oil, making it easier to flow through the reservoir. This, in turn, increases the recovery factor by improving the sweep efficiency of the reservoir, i.e., the percentage of the oil in the reservoir that is displaced by the injected water.

Mica Mica A has been producing since 1978. Located in Northern British Columbia, recent developments include horizontal drillings as well as waterflooding of the reservoir for greater recovery. Mica Mica A is currently under production by Cardinal Energy.





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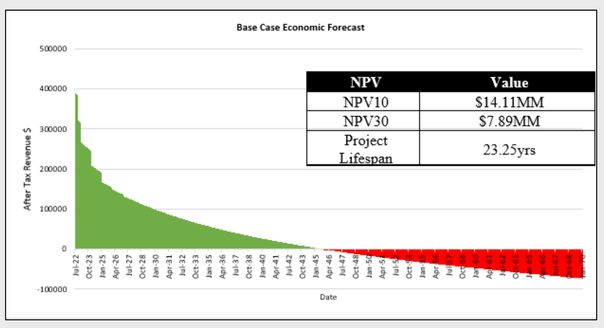
INTRODUCTION

Our goal of the Mica Mica A Optimization project is to characterize and simulate the reservoir as well as its waterflood to explore development options for the pool in order to increase the production as well as economics.

We have previously characterized the reservoir and determined its current properties, as well as future properties by calculations in ENPE 511. These volumetric properties as well as our base case economics are listed below.

OIL VOLUMETRICS		
OOIP:	1.83E+06	m3
Cumulative Oil Prod to date	3.55E+05	m3
Cumulative Oil @ Abandonment	5.13E+05	m3
Oil Recovery Factor (RF)	19.4	%
Ultimate Recovery Factor (URF)	27.9	%
Recoverable Oil in Place (ROIP)	5.13E+05	m3
Remaining Oil in Place (RROIP)	1.57E+05	m3



TASKS AND METHODS

In ENPE 531, we have taken our calculations and brought it to software that can more accurately simulate a reservoir and from that we will be rerunning economics for different scenarios.

- Reservoir simulation: Using CMG, Builder, IMEX to digitize maps, running simulation, doing history match, and running forecasts.
- Drilling and completions: Proposing drilling and completion strategies, preparing drilling programs, and preparing cost estimates.
- Facilities: Choosing a facilities subproject, preparing PFD, and sizing major components.
- Economics: NPV of property, Risked incremental economics for each development scenario, and sensitivity analysis.

Progress:

- **Reservoir Simulation: 70%**
- **Drilling and Completions: 50%**
- **Facilities: 50%**
- **Economics: 30%**

CURRENT RESULTS

Currently we are finishing up history matching, the gas rate for the overall pool is higher than historical data. Once we get a perfect history match, we can implement hypothetical well locations to simulate how they would perform in the future. With the future production we will be running economics to suggest what to do going forward with the pool. Important to note that our pool pressure drops from 15352kPa to 9000kPa in real life while in our simulation it drops to 6000kPa.

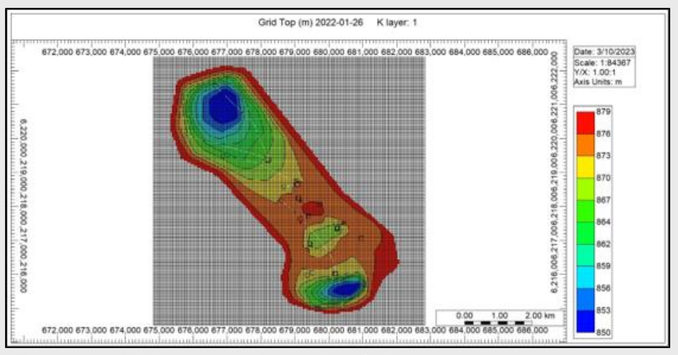


Figure 1: Grid top map from simulation

Figure 2: Permeability map from simulation

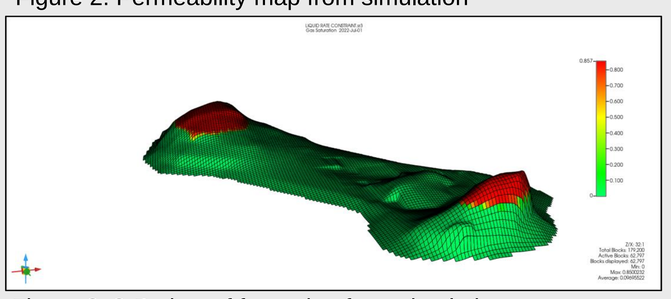


Figure 3: 3-D view of formation from simulation

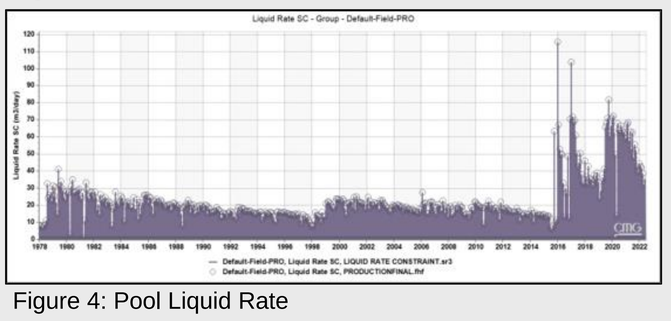


Figure 4: Pool Liquid Rate

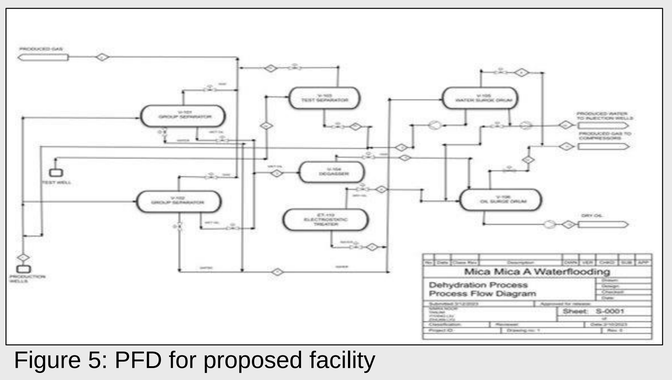


Figure 5: PFD for proposed facility

OIL VOLUMETRICS		
OOIP:	2.03E+06	m3
Cumulative Oil Prod to date	3.88E+05	m3
Cumulative Oil @ Abandonment	TBD	m3
Oil Recovery Factor (RF)	22%	%
Ultimate Recovery Factor (URF)	TBD	%
Recoverable Oil in Place (ROIP)	TBD	m3
Remaining Oil in Place (RROIP)	TBD	m3

Figure 6: Reservoir parameters through simulation

DISCUSSION

- Example simulation digitized map shows in figure 1 and figure 2
- 3-D view of Mica Mica A formation shows in figure 3. Note the gas caps
- Liquid constraint production figure 4
- Draft PFD in figure 5.
- Some current simulation reservoir parameters shows in figure 6.

Things we are looking at to lower the gas production are lowering our GOC or height of hills near producers with abnormally high gas rates, running a sensitivity on relative permeability and its effect on overall production and pressure.

Development scenarios under consideration are base case, drill a horizontal producer and drill a horizontal injector.

CONCLUSIONS

As we continue to rely on oil as a source of energy, it's essential that we use it wisely and sustainably. Waterflooding, coupled with other sustainable oil extraction practices, can help us achieve this goal. By doing so, we can ensure that we meet our energy needs while minimizing the impact on the environment.

Our pool has been properly set up in terms of volume and pay zones, and once we have the current producing rates across the board, we can give a recommendation on which development scenario Cardinal Energy should proceed with given drilling, completion, and facilities estimates associated with the development scenarios.. Understanding how waterflooding as well as optimizing a waterflooded reservoir can give great insight onto how best extract resources effectively from the reservoir while maximizing profits.

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